COOLANT TEST METHOD AND FORMULATION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to a method and chemical formulation. Specifically the invention relates to a formulation to test the ability of a coolant treatment or additive to do work. Specifically, the invention further relates to a method of using a formulation to perform testing. Specifically, the invention further relates to a method and chemical formulation that can test a coolant treatment's or additive's ability to perform work via chelation and sequestration of scale causing contaminants.

Description of the Related Art

Typically, prior art, as applicable to coolant treatment for heating, ventilation, and air conditioning (HVAC), has been to measure the total dissolved solids (TDS) that are present in the coolant or water. As more coolant treatment or additive is introduced into the coolant or water, the TDS increases. As the treatment or additive is removed from the coolant or water, either through blow down, precipitation, or some other means, and fresh make up water is added, the TDS goes down, indicating that more treatment or additive is required. The problem is, that contaminants in the water also contribute to the TDS of the coolant or water, and when the treatment or additive components start to precipitate, harmful scale normally starts to form, and the addition of more treatment or additive only serves to increase the precipitation. Thus, using TDS to determine when to add additional chemicals to a coolant is by no means tied to the ability of the chemicals in the coolant or water to do work.

Therefore, a need exist for both a method and formulation that will allow a coolant treatment additive's actual ability to do its intended work to be measured.

BRIEF SUMMARY OF THE INVENTION

Accordingly, several objects and advantages of my invention are:

To determine the ability of a coolant treatment or additive to actually perform work.

To be quick and easy to use, without complex equipment or tedious chemical manipulation.

Further objects and advantages of the invention will become apparent from a consideration of the drawings and ensuing description.

The invention satisfies the need for a method and formulation that will quickly and easily determine the ability of a coolant treatment or additive to perform the actual work for which it was intended. This is accomplished by measuring the ability of the coolant treatment or additive to chelate and sequester.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1-5 illustrate a method and associated system for a coolant test method and formulation.

DETAILED DESCRIPTION OF THE INVENTION

My invention is both a formulation and a method of testing the ability of a treatment or an additive in a coolant solution, or other water based solution, to actually perform the work of chelating, sequestering or otherwise rendering harmless, scale forming contaminants, such as calcium.

The formulation portion of the invention utilizes an indicator dye that reacts with calcium in water to produce one color, while in water without calcium, or with calcium that is bound chemically, the same dye produces a different color.

In order for most dyes to function properly, there should be a source of hydroxide present. And if there is to be a color produced other than that produced, in water essentially free from calcium, then a source of calcium must also be present. Therefore the preferred indicator solution consists of:

(1) The indicator dye

(2) The hydroxide source

(3) The calcium source

(4) And, of course, water.

Since it is desirous to conserve weight, due to the costs to commercially ship the invention to points of use throughout the World, and being that water would, by many magnitudes, be the heaviest portion in the invention while also being the most commonly available and least expensive portion of the invention, the indicator solution, in the preferred embodiment, would be preferentially two separate components. One component, Part A, would consist of the indicator dye, the source of hydroxide, and the source of calcium. The second component, Part B, would be water that is essentially free of calcium, such water being readily available in any industrialized area of the World, and referred to as water 8 in Figure 3.

With Part A being separated from the water, the physical amount of Part A required to do a test is so small as to make it essentially impractical to use. Therefore, an inert (to the reactions involved in this invention) extender is included in Part A so as to make measuring and utilization practical. In the preferred embodiment Part A is formed into a tablet 6 as shown in Figure 3.

To make the indicator solution, a certain amount of Part A is mixed with a certain amount of water, Part B. In this embodiment the proper amount of Part A is preformed into tablet 6. When properly mixed, the indicator solution is ready to work and will be the calcium reacted color of the dye which, in a preferred embodiment, would be violet as indicated by the raw indicator solution 9 in Figure 4.

To perform an actual test, the afore mentioned indicator solution is first mixed, preferably in a suitable sized Erlenmeyer flask 7 to facilitate swirling and mixing. Next a sample of the coolant solution to be tested 3 is drawn from a suitable sample port 2 from the system under test 1 into a suitable sized beaker 4, or other non-contaminated container, as shown in Figure 1. With a pipette 5, or other suitable instrument as shown in Figure 2, the coolant solution 3 is titrated into the indicator solution 9, while swirling the flask 7, or otherwise mixing to ensure a proper reaction. As the coolant solution 3 is titrated into the indicator solution 9, if the coolant solution contains active chelation, sequestration, or some other active means to bind calcium then the calcium contained in the indicator solution is bound proportionally to the amount of active component in the coolant solution. As the calcium is bound by the coolant solution, the dye is freed from its reaction with the calcium and allowed to return to its natural, calcium free, desired color 10, in Figure 5, which in a preferred embodiment would be blue. By knowing the amount of coolant solution 3 required to produce the desired color 10, the amount of active treatment or additive in the coolant solution 3 can be determined. This determination can then be used to determine the amount of additional treatment or additive that is to be added to the system 1 so as to maintain the proper level of active treatment or additive in the coolant solution 3.

While there are numerous indicator dyes that will produce various colors when free from calcium or reacted with calcium, and while there are various sources of calcium that can react with the indicator dye, and while there are various sources of hydroxide, Part A of a preferred embodiment of the invention can be made of the following:

Calcium Hydroxide in the ratio of from 0.1 to 10 parts by weight.
Eriochrome® Black T in the ratio of from 0.1 to 10 parts by weight.
Modified Corn Starch in the ratio of from 10 to 100 parts by weight.

And while there are various sources of water that is essentially free from calcium, Part B of a preferred embodiment is distilled water at a ratio of from 100 to 1,200 parts to 1 part of Part A by weight.

The following pages provide additional disclosure and illustrations of further embodiments of the invention and are incorporated herein in their entirety to form an integral part of the specification.

Treatment Description:

CT01™ provides a two-pronged solution for coolant deficiencies: **treatment** and **prevention**. As a **treatment**, it effectively solves such problems as corrosion, scale, low thermal transfer, and the root cause of most coolant difficulties: water composition. In terms of **prevention**, it protects systems from the re-occurrence of these problems. **CT01™** ingredients were carefully chosen for their effectiveness in specific tasks, but also for having minimal environmental impact and for the safety of those using it.

As a measure of **CT01™'s** safe handling, each ingredient is either approved for use on food preparation surfaces, or as a food type additive, or as generally recognized as safe (GRAS). A measure of **CT01™'s** effectiveness is that many of its ingredients, in addition to handling their specific task; work synergistically with each other, or even with natural protective elements found in the systems being treated. All this combines to make **CT01™** a water treatment solution that provides safe, effective de-scaling; surface protection, and substantial economic benefits.

In, hot or chilled hydronic systems and cooling tower applications, **CT01™** is an effective means of cleaning (de-scaling) and treating the metal surfaces of these systems. **CT01™** works in conjunction with a metal's natural protective surfaces to promote "healing" of corroded areas, and assists in stopping corrosion before it starts.

Application Procedures:

Step 1: Determine the total water volume of all systems that are to be treated. This includes any hot, chilled, and condenser loops. If the system volumes are not known, an estimate of the closed loops can be obtained by using the **SysVol Calculator Program**. Your **CT01™** representative can assist you with this procedure.

Step 2: Using the total water volume figures from **Step 1** apply these figures to the **CT01™ Calculator Program** to calculate the amount of **CT01™** required to de-scale the targeted loops.

Note: The **CT01™ Calculator Program** will ask for feed water hardness before it can calculate the proper amount of **CT01™** required. With a standard feed water hardness of less than 10 grains/US gallon (171 mg/liter), 15.5 pounds (9.1 liters) of **CT01™** will be required for every 1,000 US gallons (3785 liters) of system water to be treated. Your **CT01™** representative can provide you with the proper **CT01™** quantity figures for your systems once Step 1 has been completed.

Step 3: If the systems to be treated with **CT01™** are presently using a water treatment program, or has a considerable amount of chemical remaining in the water from past treatment programs, then all systems must be completely drained and refilled before the de-scaling process is to begin. Draining and refilling the system will serve to remove loose sediment and to dilute the current chemical treatment. We recommend using a controlled blow-down especially if the system(s) to be treated are operating so as to avoid having to shut the system down. Although we recommend that a system that has not

(cont'd):

been chemically treated also be drained, it is not mandatory. This is an important step in the de-scaling process using the **CT01™**. Please consult with your **CT01™** representative regarding the drain/fill protocol before proceeding.

Step 4: Once the correct quantity of **CT01™** has been introduced into the system(s) it will take a minimum of forty-eight operating hours for the de-scaling cycle to complete. If the system(s) to be de-scaled are off-line, the circulating pump(s) must be brought online to assist the **CT01™** in the de-scaling process. If time is a factor in the de-scaling process, doubling the quantity of **CT01™** will reduce the time to twenty-four hours.

During the de-scaling procedure a 20µm string-wound filter element should be used to capture contaminants (see **Filtration** section below).

Step 5: After the prescribed running time has elapsed, the system(s) being de-scaling using the **CT01™** should be drained again and refilled. If the system is online then a controlled blow-down procedure should again be followed (as in Step 3). Once the system(s) are properly drained and refilled, the previously calculated quantity of **CT01™** from Step 2 can now be administered and the system is ready for the season.

NOTE: *Every step taken to reduce contamination between the old water treatment chemicals along with the removal of loose sediment prior to the **CT01™** de-scaling process will be cost effective in the increased life and performance of the systems upgraded to the **CT01™** water treatment program. Please consult with your **CT01™** representative if you have any concerns or questions regarding de-scaling.*

Tools:

Simple and cost effective tools can be used in the actual administration of the **CT01™** product to systems to be treated. A 4 to 4.5 litre plastic measuring jug and a 1 or 2 cup capacity plastic scoop is all that is needed. On most systems to be treated a pot feeder is the normal point of entry for chemical treatment. Optional equipment: an appropriate-sized plastic **"Powder Funnel"**.

Filtration:

Another important part of successful water treatment for HVAC and boiler systems is filtration. Coupled with a proper filtration system a **CT01™** water treatment program can also add years to the life of any system. We recommended using a 10 inch particulate filter housings for water volumes under 1,000 US gallons (3785 litres) and 20 inch particulate filter housings for water volumes above 1,000 US gallons (3785 litres).

It is further recommended that metal filter housings be used for all systems with operating temperatures above 100°F. Replacement cartridge elements should be of the string-wound type. For the **CT01™** de-scaling procedure 20µm cartridges elements should be used to capture contaminants and particulates. Once the de-scaling process has completed and the systems have had a proper maintenance dosage of **CT01™** applied, 5µm cartridge elements are recommended.

Filtration (cont'd):

A flow indicator or flow monitor is a recommended accessory for filtration systems as a method for indicating filter servicing. A full compliment of filtration housings, flow indicators/monitors, and supporting cartridges are available from ***WaterSmartz***, please ask your **CT01™** representative for further details and pricing information.

Testing:

For open loop systems the standard bacteria test is still required. Please contact your **CT01™** representative regarding bacteria testing. In addition to bacteria testing, a simple once-per-week test using **TestTabs™** will provide an indication of the amount of **CT01™** that will be needed to top-up the open loop to compensate for the amount of make-up water.

Closed loop systems will only need to be tested using **TestTab-01™** a few times per year, more often if the system is making up water due to leaks. To reduce the amount of **CT01™** that has to be added to a closed loop system it is much more economical to locate and have the leak(s) repaired.

Please consult with your **CT01™** representative for information and pricing regarding the **TestTab-01™** test kits.

TestTab-01™:

While the conventional means of testing the chemical treatment additive in HVAC and boiler systems by measuring the total dissolves solids (TDS) in the water is considered the standard, TDS is only an indication of what is in the water and not what the chemical additive can actually do. This results in many systems being over-treated, while some may actually be under-treated.

TestTab-01™, provides an actual indication of the ability of the **CT01™** to perform work in your system. The **TestTab-01™** test system works by utilizing a dye that is normally blue, which reacts with calcium to turn violet or purple. Calcium was chosen for the **TestTab-01™** test system due to the fact that calcium is the major contributor to scale in HVAC, boilers, and other types of water based systems.

The test uses a sample of the **CT01™** treated coolant water to react with (sequester or chelate) the calcium in a **TestTab-01™** solution. When the calcium is reacted with by the coolant, then it is no longer free to react with the dye, therefore causing a change in the **TestTab-01™** solution's color. The actual procedure for using the **TestTab-01™** is to:

Step 1: In a flask, dissolve one **TestTab-01™** in approximately 50 ml of distilled, or clean calcium free water. A 250 ml Erlenmeyer flask works best. The water will turn violet or purple in color. This may be more easily observed if the area is brightly lit using florescent lamps. **(See Figures 3 and 4)**

Step 2: In a separate container, collect a 50 ml sample of the **CT01™** treated coolant water for testing. **(See Figures 1 and 2)**

Step 3: Using a 10 ml eyedropper, slowly add the collected sample of **CT01™** coolant water to the Erlenmeyer flask containing the **TestTab-01™** water solution. As the coolant sample is added to the flask, use a swirling motion to ensure that the **TestTab-01™** solution and the **CT01™** treated coolant water are thoroughly blended together, while also watching for a change in color towards blue from violet or purple. **(See Figures 2 and 5)**

TestTab-01™ (cont'd):

Step 4 While adding the coolant sample to the test solution make note of the following information:

- If the color changes to blue with the addition of 10 ml of the coolant sample, there is sufficient **CT01™** in the system.
- If 10 to 20 ml is required for a change in color, the system requires a 25% top-up dose of **CT01™**.
- If 20 to 30 ml is required for a change in color, a 50% top-up dose is needed of **CT01™**.
- If 30 to 40 ml is required for a change in color, a 75% top-up dose is needed of **CT01™**.
- If the color has not changed after 40 ml is added, then a full dose of **CT01™** is required.

Please consult with your **CT01™** representative for any concerns or questions you may have regarding the testing procedures.

Continued Maintenance:

During either the heating or cooling seasons, topping up the closed loops with **CT01™** after testing with the **TestTab-01™** kit is all that is needed to maintain proper **prevention** levels. When nearing the end of an operational heating or cooling season or before a system is to be taken off-line it is highly recommended that a full dose of **CT01™** be administered to the loop(s).

This will provide added protection to the loop(s) during the off-season when the pumps are not circulating coolant water. It is also recommended that during the off-seasons, that the circulation pumps be operated at least one hour per week. This will ensure that the **CT01™** remains distributed throughout the system(s).

Emergency Procedures:

Please check **MSDS** information.

Additional Information:

Since numerous factors can affect the scale and corrosion in HVAC, boilers, and other water based process equipment, **CT01™** must be applied by a technician trained in its proper application. Amounts required may vary dependant on the present condition of the systems to be treated and with respect to the impurities within the make-up feed water used.

CT01™ consists of concentrated chelating, sequestering, and anti-corrosion agents. When working with any powdered chemical always wear proper protective equipment to avoid breathing dust, contact with eyes and skin, and ingestion. In case of eye contact, flush with water for 30 minutes. In case of excessive ingestion, do not induce vomiting, drink large amounts of water and in both cases seek immediate medical attention.

Disposal:

Disposal of **CT01™** powder or solution, should be carried out in accordance with the applicable municipal, state, provincial, federal laws and regulations.

While the principles of the invention have now been made clear in the illustrated embodiments, there will be immediately obvious to anyone skilled in the art, many modifications of structure, arrangements, proportions, the elements, materials and components used in the practice of the invention and otherwise, which are particularly adapted for specific environments and operation requirements without departing from those principles. The invention is to be limited only by the scope of the appended claims and the equivalents thereof.